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GB 2219733 A WO 95/01888 A1 US 4940285 A
US 4901421 A

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INT CL^6 B60N 2/06 2/08 2/12
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(54) Adjustable rail assembly

(57) An adjustable rail assembly for motor vehicle seats is disclosed in which the slide and/or the guide rail are composed of two or more parts. This allows the rail assembly to be assembled (with anti-friction means between them) and then the rail parts to be joined together. This avoids the need to manufacture the rails to tight tolerances and allows cheaper manufacturing processes to be used. The adjustable rail assembly may be motor driven and may carry position locking means.

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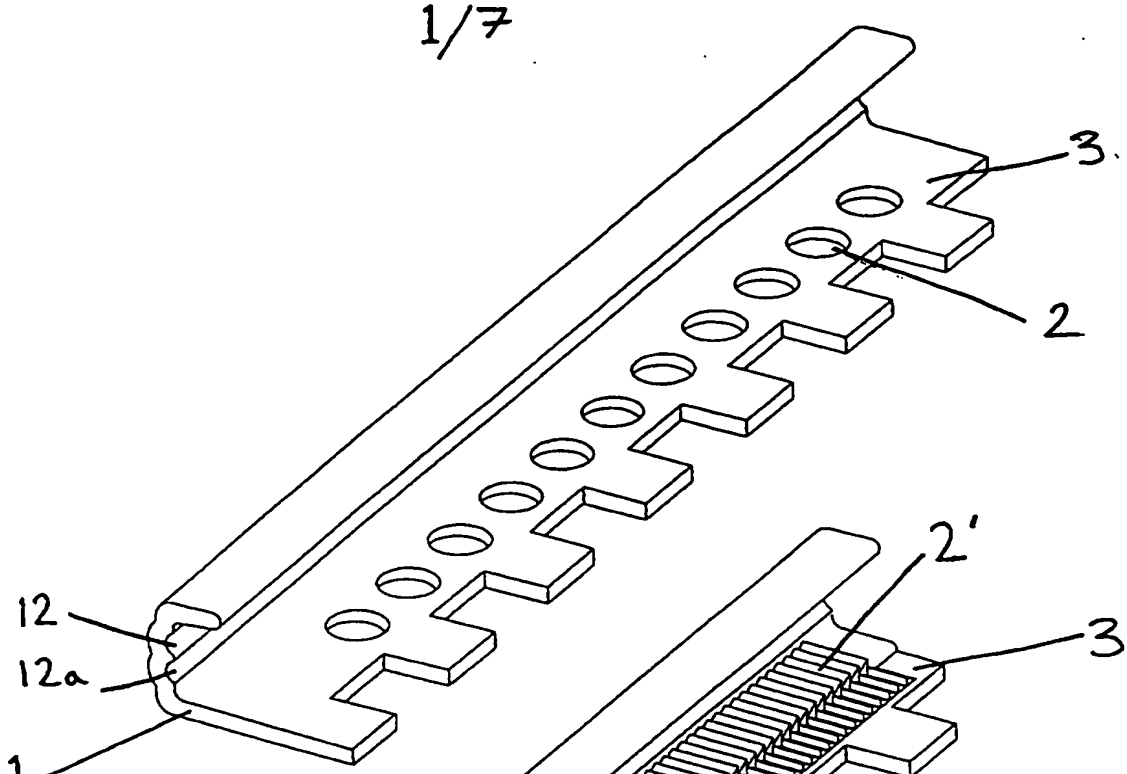

Fig 1a

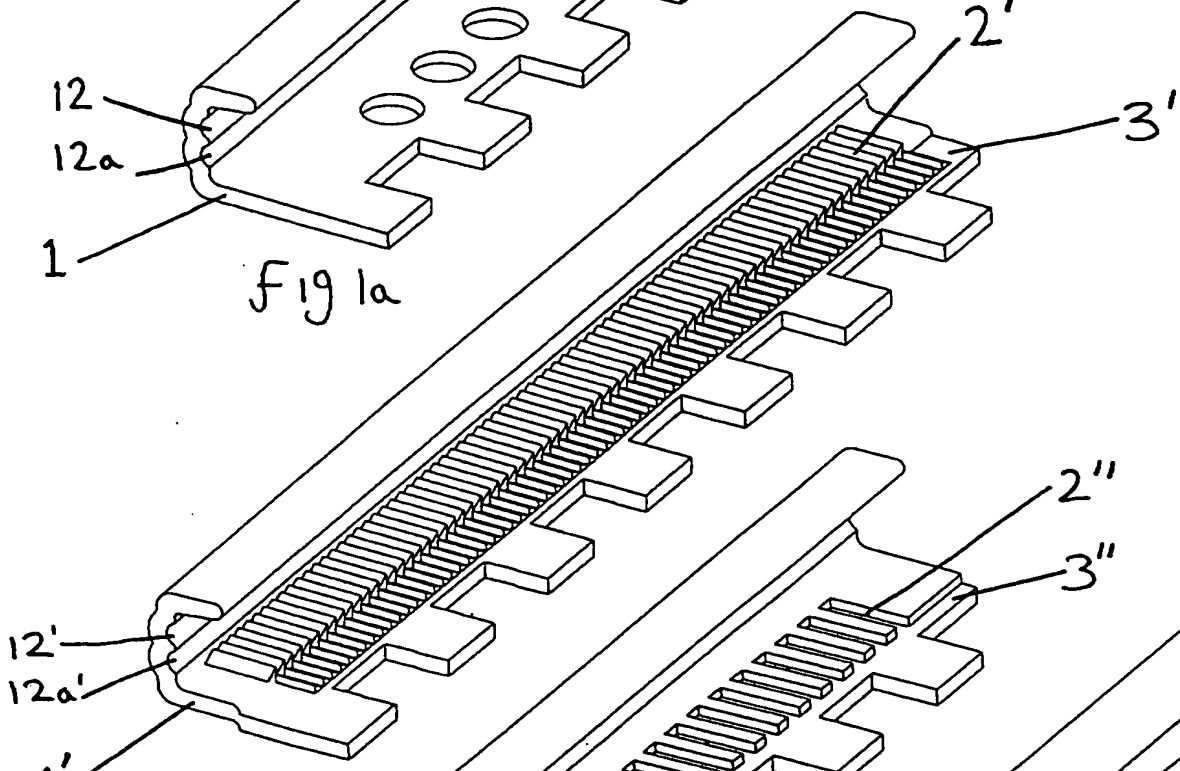

Fig 1b

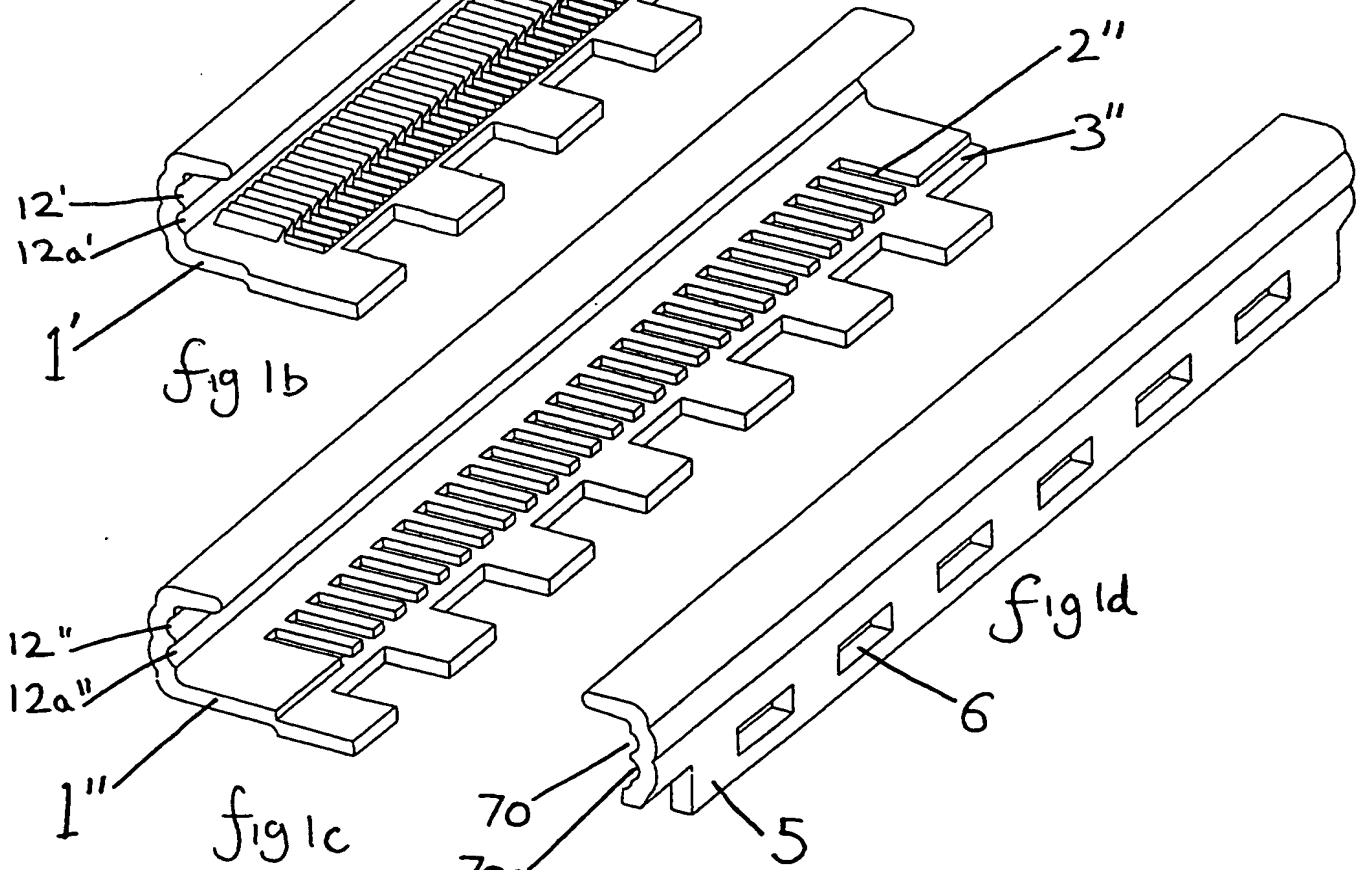

Fig 1c

Fig 1d

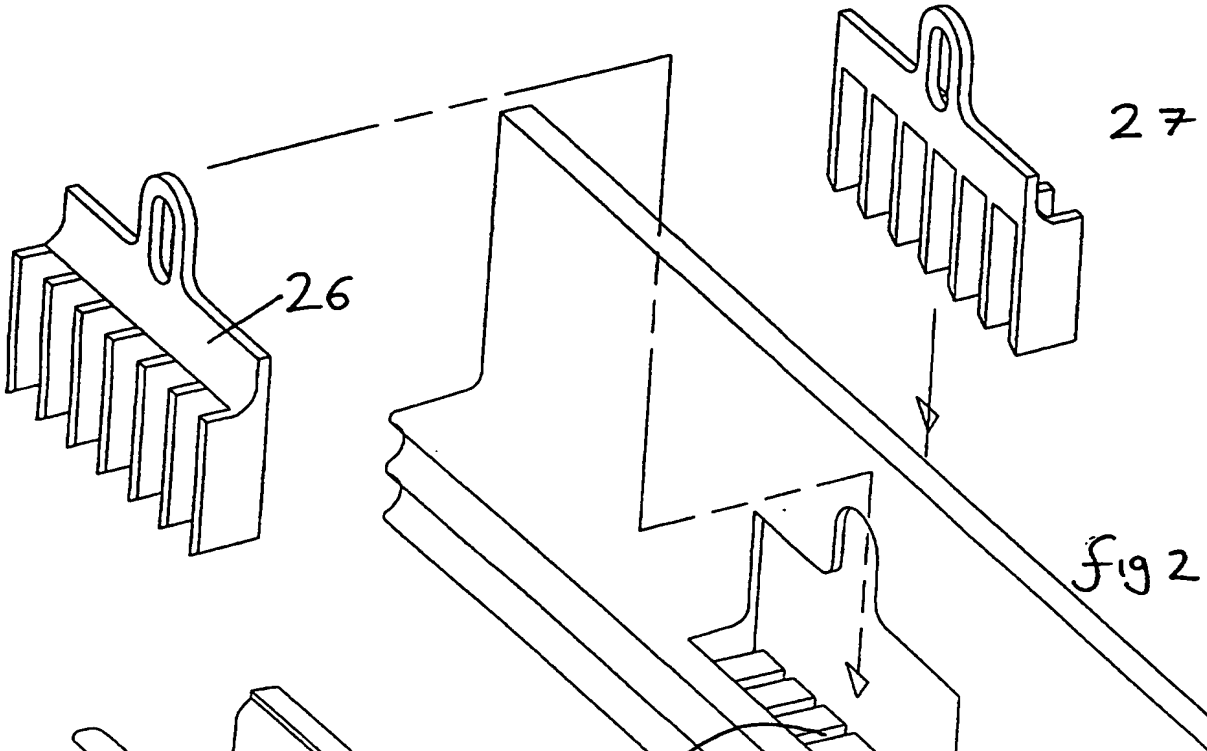

fig 2

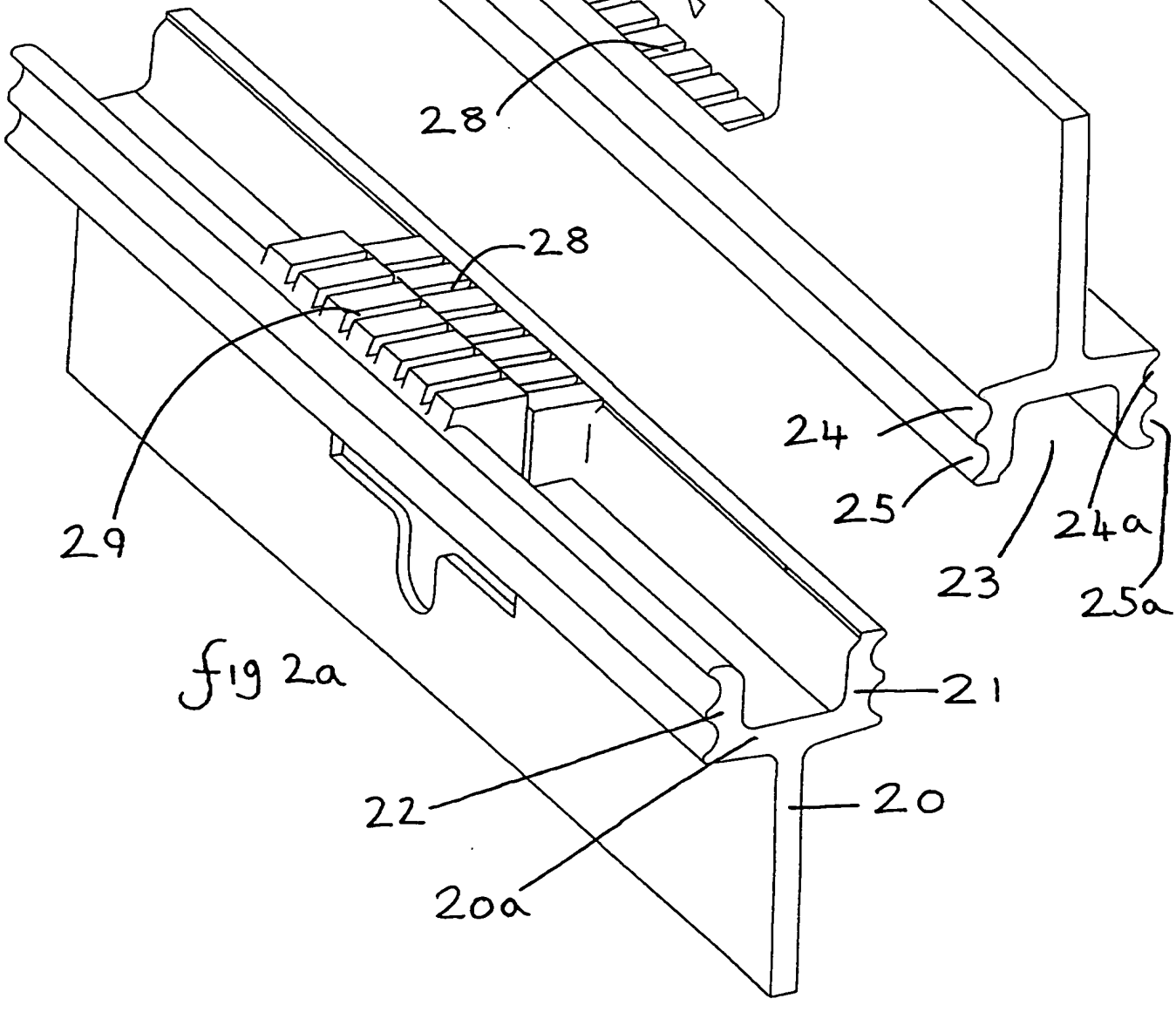

fig 2a

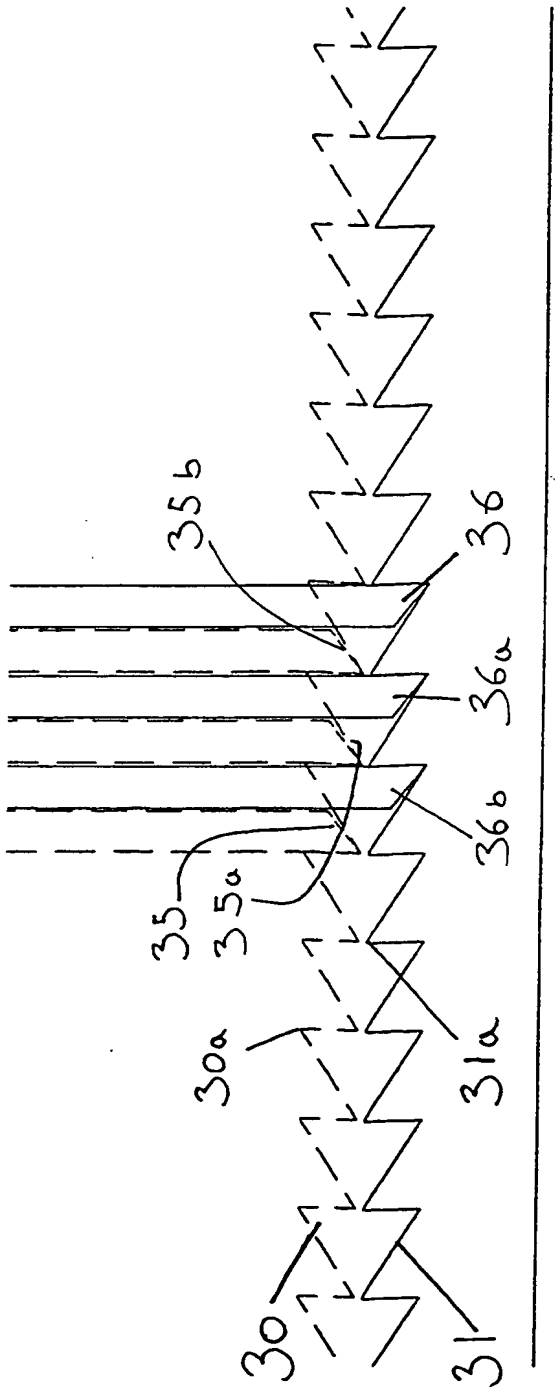

fig 3

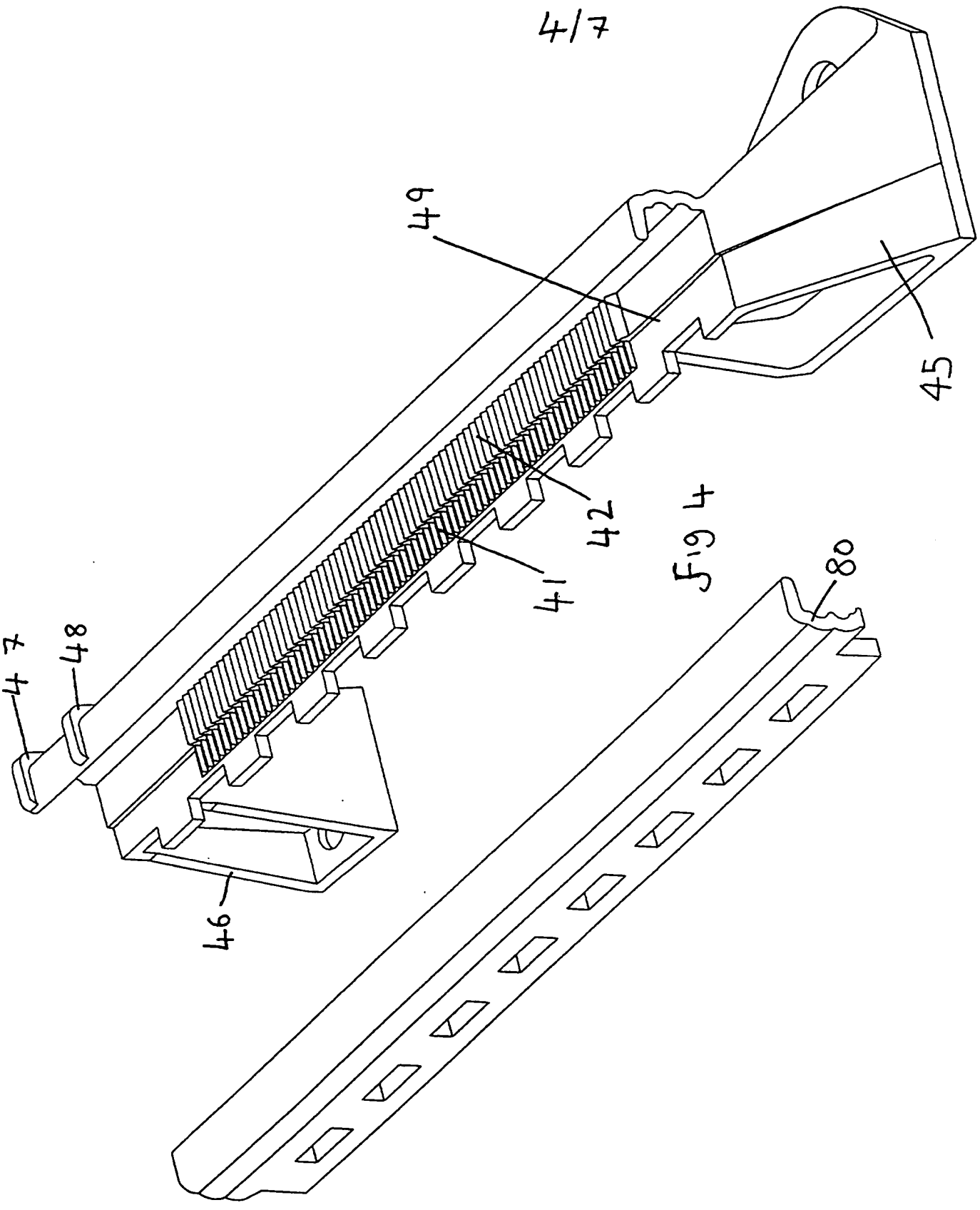

Fig 4

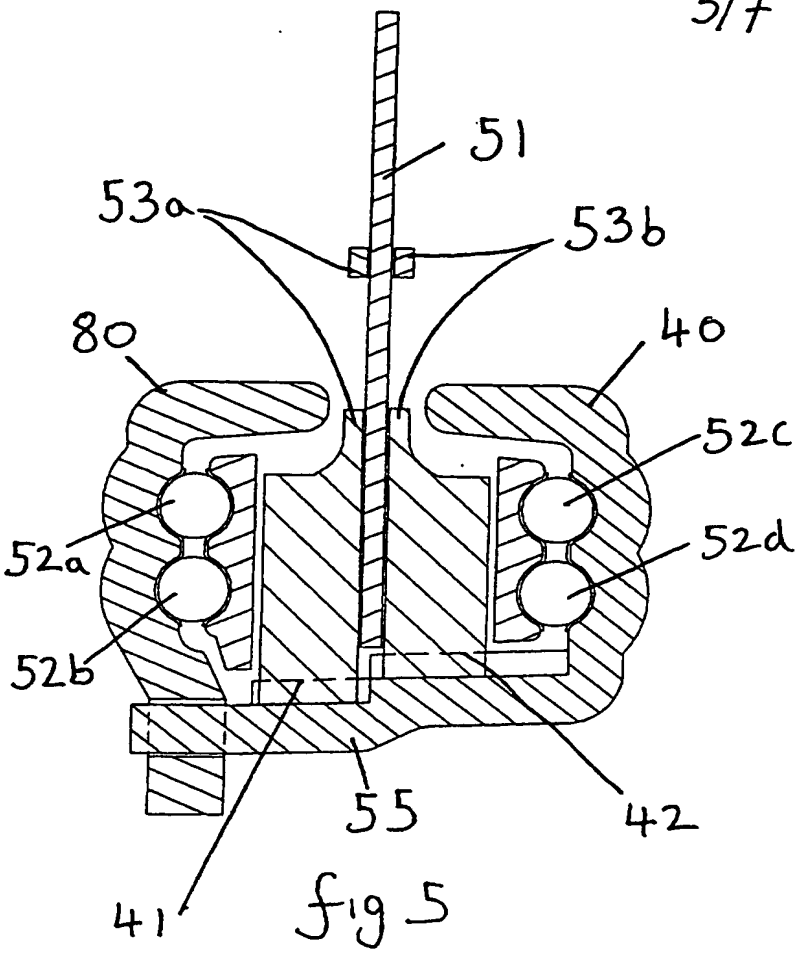
51
53a
53b
80
40
52c
52a
52d
52b
55
42
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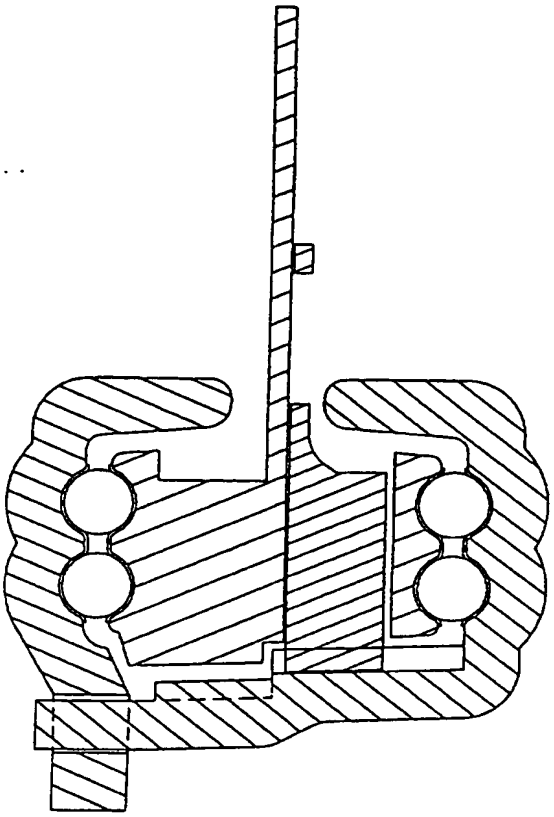
fig 5



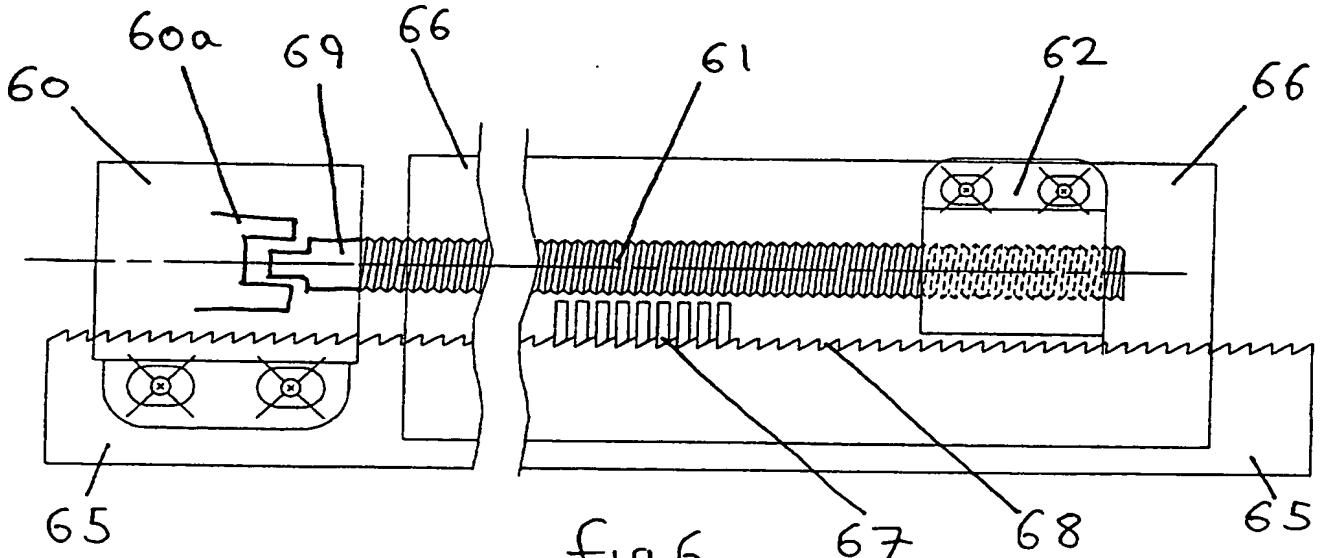

60a
69
66
60
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fig 6

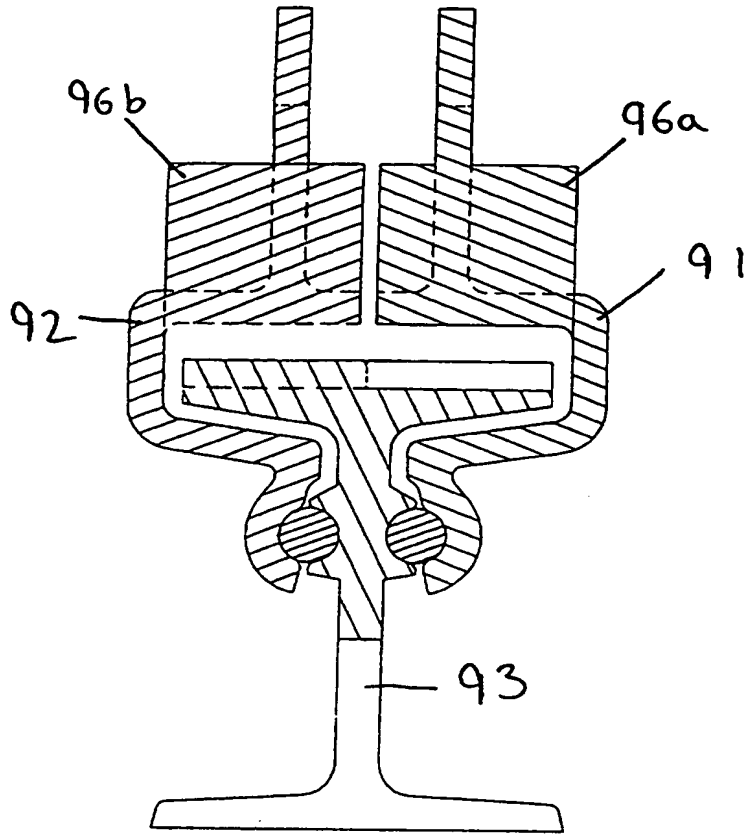

fig 7a

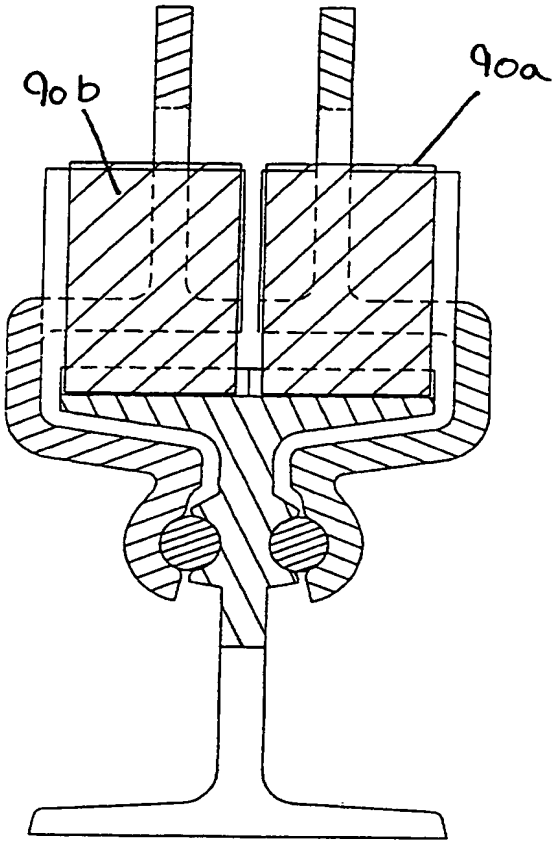

fig 7c

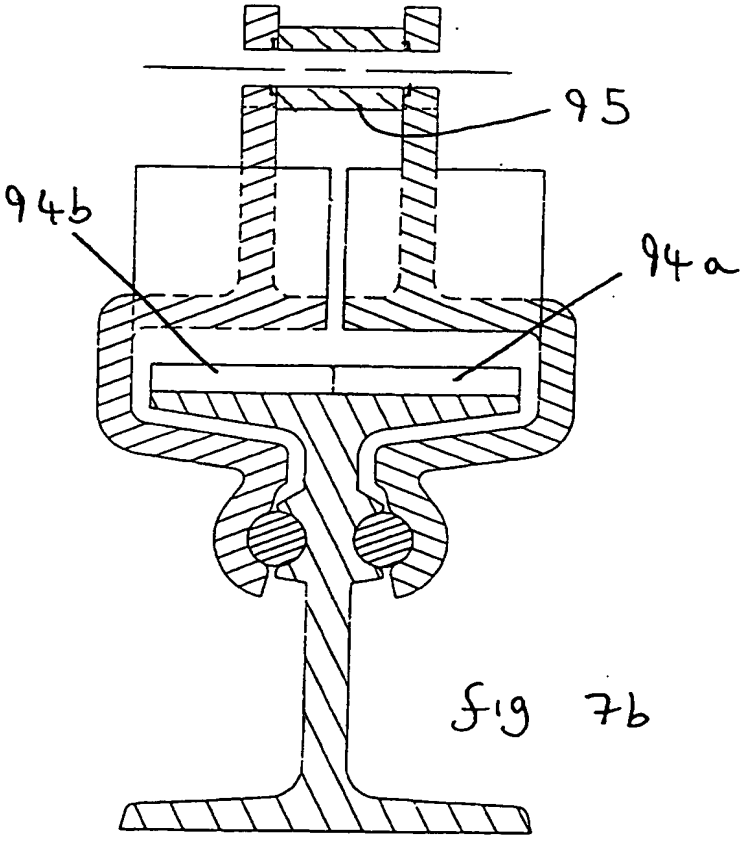

fig 7b

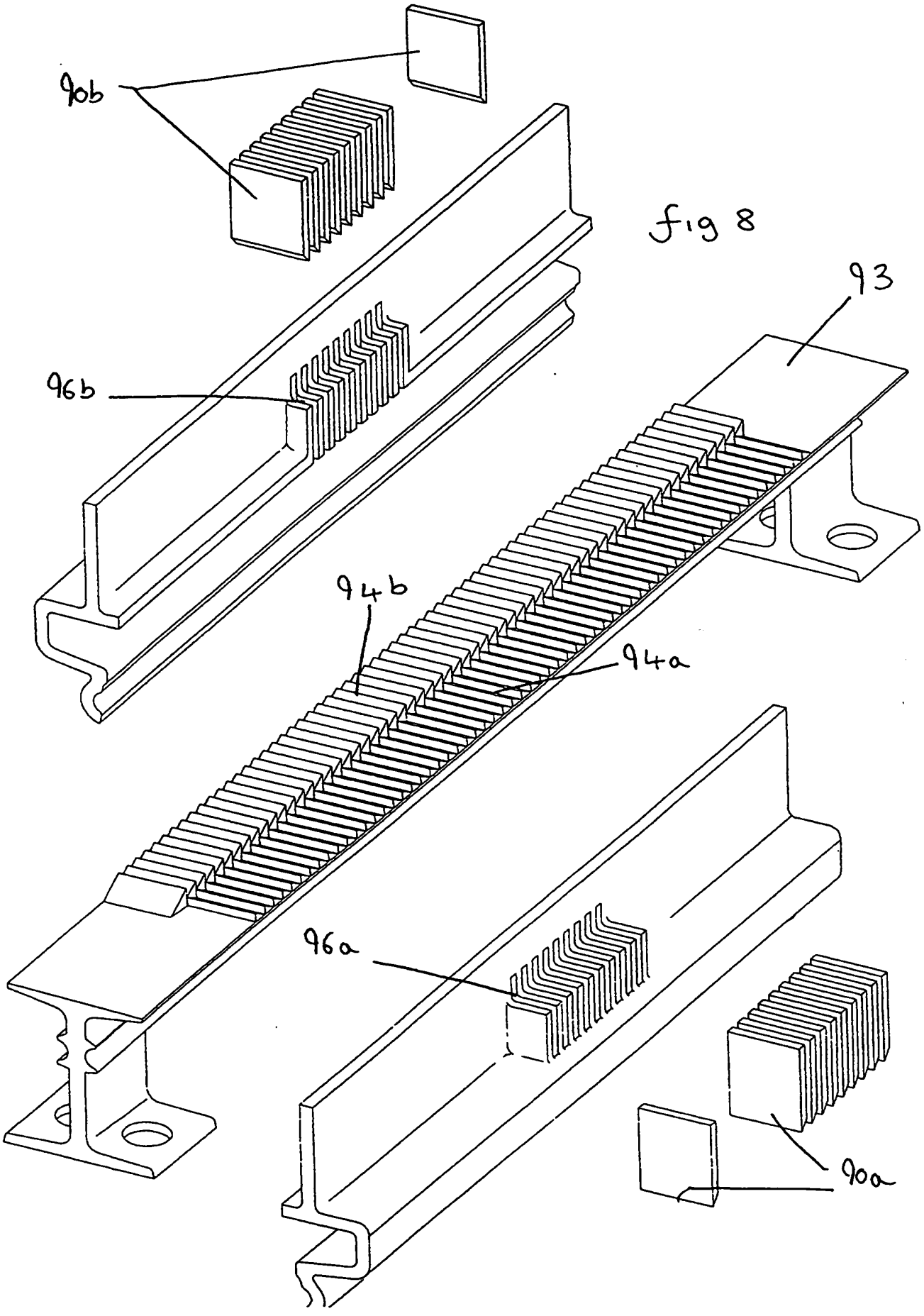

fig 8

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ADJUSTABLE RAIL ASSEMBLY

The present invention relates to an adjustable rail assembly for motor vehicle seats and the like comprising a guide rail for mounting to a vehicle floor and a slide rail for mounting to a vehicle seat and anti-friction means acting between said guide rail and said slide rail to aid relative longitudinal movement of the guide member to the slide member.

Mounting arrangements of this type are known, in these prior art arrangements the guide rail and slide rail of the adjustable rail assembly are invariably produced as metallic extrusions or by continuous forming of metallic strips into profiles of uniform thickness which are then assembled together with anti-friction means to produce the mounting arrangement.

To ensure that the relative movement of the slide rail and the guide rail takes place smoothly but with a predetermined degree of resistance the extrusions or profiles must be produced to tight manufacturing tolerances thus increasing the cost of the mounting arrangement, furthermore the metallic extrusion or profile has to be provided with a variety of; brackets holes notches and bosses to facilitate attachment to the floor of a vehicle and to the components of the seat frame, all of which adds manufacturing complexity and therefore cost, further an extrusion or a continuously formed profile has a uniform thickness throughout any given length, resulting in increased material weight of the components that must be designed to the thickness required for the area under greatest loading stress.

In accordance with the invention to reduce the cost and weight of the mounting arrangement it is proposed that said guide rail and or said slide rail comprises at least two component parts which are joined together after the other of said guide rail or said slide rail and the anti friction means are positioned relative to at least one of said component parts to produce an adjustable rail assembly with a predetermined resistance to relative longitudinal motion of the slide rail to the guide rail.

The slide rail and the guide rail items can be made to much greater tolerances than previously required or could be made by other mechanical process which are themselves less accurate than extrusions but are much cheaper e.g. rolling , bending and stamping.

One can arrange the pre assembly operation such that a pre-load required to take out the tolerance in the components is applied to the assembled but not yet joined components of the assembly which are then joined together to produce an adjustable rail assembly with the required resistance to relative longitudinal motion between the guide rail and the slide rail.

The components can then be joined by welding, mechanical deformation of one member or chemical bonding all of which are readily adaptable to mass production and hence the cost of the assembly can be reduced.

In conventional adjustable rail assemblies the fingers which lock the slide rail relative to the guide rail are spring loaded, disengaging the fingers requires effort to overcome the relatively strong springs force which is required to assist in the alignment of slide rail apertures and or castellations with guide rail apertures and or castellations, this in most cases requires a lever situated beneath the front of the seat which is an ergonomically unsuitable. Often when the finger are released, re-engagement does not take place and the slide rail is held relative to the guide rail by friction and or the force of the springs pressing the fingers against the guide rail. By employing pawl and ratchet locking means only a comparatively small amount of movement of a the engagement pawls is required to lock and unlock a slide rail to a guide rail, also a relatively small spring is required to ensure the pawls return to an engagement position , these two factors allow the guide rail to be released by pushing a button which can be situated in a convenient position .

By producing the guide rail and or the slide rail as two or more component parts it is possible to produce them as relatively simple castings since the extremely complicated form of the one piece component is reduced to an easily cast shape

To achieve weight reduction without jeopardising the strength of the component they can be cast from materials having the mechanical properties required whilst being considerably lighter than the conventional steel used in prior art assemblies. Preferably the castings would be produced from aluminium or an alloy thereof alternatively they could be cast from magnesium or an alloy thereof.

It is not always possible to provided for the base of the guide rail to be mounted directly on the floor of the vehicle where it is to be used. In such cases mounting feet are attached to the guide rail by welding or riveting. Similarly other attachment points for other components carried by the rails are added by welding or riveting.

In accordance with a further aspect of the present invention at least one leg for the guide rail is provided on the casting of the guide rail.

Producing the slide rail as a casting is particularly advantageous as one can in accordance with another aspect of the invention, integrally cast components of the recliner mechanism for the seat back carried by the sliding rail.

In accordance with a further embodiment of the invention the adjustable rail assembly further includes locking means which lock said guide rail and said slide rail in any one of a plurality of longitudinal positions. This is especially advantageous when in accordance with a further embodiment of the invention the locking means comprises of pawl and ratchet means wherein the pawl means is carried by one of the rails and the ratchet means is formed in the other rail.

To ensure that the pawl and ratchet engagement is strong enough to withstand the forces acting on it, it is proposed the pawls should be provided with a plurality of teeth wherein any loading on the pawl will be shared between the teeth.

With conventional adjustable rail assemblies the locking means usually takes the form of apertures or castellations formed in or on the rails into which locking fingers which pass through pairs of aligned apertures. The number of seat positions possible is thus limited since each aperture or castellation reduces the strength of the rails.

In accordance with a yet further embodiment of the invention the teeth of the ratchets are cast into the ratchet carrying rail and hence it is possible to increase the number of adjustment positions of the assembly without decreasing its mechanical strength.

A further embodiment envisages the provision of two racks of teeth provided on the ratchet carrying rail one to lock against movement in one longitudinal direction for seat adjustment e.g. towards the vehicle controls and the other to lock against movement in the other direction e.g. away from the vehicle controls.

Conveniently the two racks of ratchet teeth could be provided on the same surface of a rail.

Advantageously the pawl means which could comprise of one or more pawl members is guided and supported in guides formed in the non ratchet carrying rail.

Due to the high number of adjustment position possible with an adjustable rail assembly in accordance with the invention it is possible to adapt the assembly rendering it suitable for use as a power driven adjustable rail assembly.

Positioning of the slide rail relative to the guide rail in a motor driven adjustable rail assembly is achieved by using a stationary motor to rotate a screw threaded shaft through a collar or nut. The collar or nut can be mounted on the slide rail of the assembly and when the motor rotates the screw thread the collar or nut moves along the screw thread until the desired

position is reached and the motor is de-energised. The adjustment of the position of the slide rail is no longer incremental and hence it is not practical provide additional locking means to lock the two rails together since the distance between locking positions on the rails as currently produced is dependent on the spacing of the apertures or castellations which to maintain sufficient strength in the assembly is limited to a distance greater than that required when the locking means are pawl and ratchet means with the ratchet teeth formed on the surface of one of the rails Thus current arrangements rely upon the mounting for the motor to carry any crash loads acting on the seat hence it must be robustly designed and consequently adds noticeably to the weight of the adjustable rail assembly.

In accordance with a further feature of the invention an adjustable rail assembly is provided for powered operation by an electric motor wherein the electric motor is mounted relatively stationary to either the guide rail or the slide rail and a nut or a collar which is mounted relatively stationary to the either the slide rail or guide rail is threadly engaged by a screw member driven by the electric motor wherein said electric motor and said collar or nut are resiliently mounted to their respective supports such that said pawl and ratchet mean readily interengage when said electric motor is de-energised.

In a further embodiment of the invention the electric motor and collar can be rigidly mounted to their respective supports, the play required to allow the pawl and ratchet means to engage being produced by the movement of the screw threaded shaft relative to its drive in the electric motor

Alternatively the play required could be provided in the connection between the screw thread member and the nut or collar.

The invention will be further described with reference to the following drawings in which

Figure 1a is a perspective view of a first part of a guide rail assembly.

Figure 1b is a perspective view of an alternative design of the first part of a guide rail.

Figure 1c is a perspective view of a further alternative design of the first part of a guide rail.

Figure 1d is a perspective view of the second part of a guide rail assembly suitable for use with a first part as shown in shown in figure 1a 1b and 1c.

Figure 2 is a perspective view of a slide rail assembly incorporating two ratchet members.

Figure 2a is a perspective view of the slide rail assembly as shown in fig 2. when viewed from below.

Figure 3 is a sectional elevation a portion of guide rail and slide rail assembly in accordance with the invention.

Figure 4 is a exploded perspective of a guide rail with integral mounting feet.

Figure 5 is a cross sectional view of an adjustable rail assembly incorporating the guide rail of fig 4.

Figure 6 is a schematic view of an electric motor driven adjustable rail assembly.

Figure 7a is a sectional view through an alternative embodiment of the invention.

Figure 7b is a sectional view through an alternative embodiment of the invention.

Figure 7c is a sectional view through an alternative embodiment of the invention.

Figure 8 is an exploded view of an alternative embodiment of the invention.

The first components of the guide rail assembly shown in figure 1a 1b and 1c comprises a generally "c" shaped member 1 1' 1" produced by stamping or rolling a flat metal blank. Ratchet means can take the form of apertures 2 stamped teeth 2' or castellations 2" The base 3 3' 3" is provided with protrusions 4a 4b 4c on which the second part of the guide rail is located and joined to the first part to produce the guide rail

The second component of the guide rail as shown in figure 1d The lower edges of the component are produced with slots 6 into which the protrusions on the component 4a 4b 4c

are located before the two portions are joined together either by deforming the protrusions 4a 4b 4c or by welding or bonding the parts 1 1' 1" and 7 after assembly of the slide rail 9 not shown and bearings 10 not shown.

Both parts 1 1' 1" and 7 are provided with one or more bearing races 12 12a 12' 12a' 12" 12a" and 70 70a

The components can be clamped together to provide the required pre-load before permanently joining them together.

Figures 2 and 2a disclose a slide rail suitably for use with a guide rail comprising the components fig 1a 1b and 1c when separately combined with the components of fig 1d.

The slide rail takes the form of an inverted T shaped member 20 with dependent legs 21 22 extending from the extreme edges of the T cross member 20a the legs 21 are provided with bearing races 24 24a 25 25a on the outer surfaces. Pawls 26, 27 are located in their respective guides 28 29.

The guides and supports 28 29 extend into channel 23 providing further strength to the pawl assembly.

Figure 3 discloses the use of two ratchet racks 30 31 disposed at different heights on a common but stepped surface of a guide rail to ease removal of the casting tool used to produce the toothed ratchet racks 30 31 the teeth 30a of the ratchet 30 act restrain relative movement of the slide rail to the guide rail in a direction to the left as draw when engaged by the pawl teeth 35 35a 35 b whereas the teeth 36 36a 36b of the ratchet 31 act to restrain such movement, in the direction to the right as drawn, when engaged by the teeth of the pawl.

The guide rail assembly illustrated in fig 4 comprises a first component 40 which is produced as a casting or moulding preferably aluminium or one of its alloys or another high strength to weight material such as magnesium or one of its alloys and a second component which can be produced as a casting or could be produced by extrusion rolling bending or stamping.

It is conceivable that a suitable plastic material could be used in place of a metallic alloy, if necessary one provided with suitable re-enforcement. Composite materials could also prove to be suitable.

component 40 corresponds to the component 1' shown in fig 1b however in the case supporting legs 45 46 are integrally cast to the base of the component. A pair of ratchet teeth racks 41 42 with opposing engagement dircections from one another are cast into the stepped

surface 49. Thus allowing for easy removal, in one plane, of the casting tool, forming the ratchet teeth. Strengthening ribs 47 48 are provided to produce the required rigidity of the component.

Since the component is cast any number of ribs or attachment points can be provided thus the component is thickened where the loading it is subjected to requires it and the overall weight of the component is kept to a minimum.

In an alternative design not shown the ratchet racks can be provided on other faces of the rail members there can also be provided a guide rail or a slide rail which need not require a perpendicular action of the pawl means to produce an engagement or disengagement of the pawl and ratchet means. In the case where two ratchet racks are provided they may be on separate surfaces of either guide rail or the slide rail or both on the guide rail or both the slide rail or alternatively the guide rail or slide rail may each carry a one or more ratchet racks.

A cross section of an adjustable rail assembly incorporating the the guide rail assembly of fig 4 and the slide rail of fig 2a is shown in fig 5 in which components 80 and 40 are joined together to produce a guide rail 55 within which a slide rail 51 is guided by way of bearings 52a 52b 52c 52d. the slide rail carries two pawl members 53c 53b the teeth of which are shown to engage with the teeth 41 42 of ratchet rack formed in the guide rail 55. To adjust the relative longitudinal position of the slide rail 51 to the guide rail 55 pawl members 53a 53b are raised perpendicularly as drawn, to disengage the teeth of the pawl from the teeth of the ratchet racks 41 42 formed in guide rail 55

The slide rail is the moved to the desired position as the pawl members 53c 53b are released to engage another set of teeth in the ratchet rack 41 42 fig 6 discloses schematically an embodiment of the invention applied to an electric motor driven adjustable rail assembly.

An electric motor 60 mounted on the guide rail 65 drives a screw thread shaft 61 which is threadly engaged by a collar 62 mounted flexibly on a slide rail 66 to produce the play required to ensure the pawl members 67 engage with the teeth of the ratchet 68 only one pawl and ratchet are shown for simplicity it being shown that another pawl and ratchet pair acting in the other direction are required to lock the seat in both directions.

At least one of the members electric motor 60 and collar 62 are mounted on their flexible support members Alternatively sufficient play can be provided in the threaded connection of the connection of the shaft 61 to the collar 62.

A further alternative method to provide a connection is illustrated between the end 69 of shaft 61 and its driving member 60a in the electric motor 60.

In figures 7a 7b and 7c slide rail half 91 and slide rail half 92 are fixed together to allow gap 96 in which pivot 95 is located and supported by slide rail halves 91 and 92

In fig 8 pawls 90a and 90b are fitted into respective support slots 96b and 96a before slide rail halves 91 and 92 are permanently joined

Claims

1 Adjustable rail assembly for motor vehicles seats and the like comprising a first guide rail for mounting to a vehicle floor a second slide rail for attachment to a vehicle seat guided by the first said guide rail and anti friction means acting between said first guide rail and said second guide rail to allow relative movement of the two members wherein said first guide rail or said second slide rail comprise at least two component parts which are joined together after, the slide rail and anti friction means are positioned relative to at least one of said component parts of said guide rail or said guide rail and anti friction means and positioned relative to one of said components of said slide rail with a predetermined resistance to relative motion of the slide rail to the guide rail.

2 Adjustable rail assembly as claimed in claim 1. wherein the components are joined together by welding.

3 Adjustable rail assembly as claimed in claim 1. wherein the components are joined together by deformation of material of one component to lock said other component to it.

4 Adjustable rail assembly as claimed in claim 1. wherein the components are joined by chemical bonding.

5 Adjustable rail assembly as claimed in any of the claims 1-4 wherein at least on of the said guide rail components is produced by casting.

6 Adjustable rail assembly as claimed in claim 5 wherein said casting is produced from aluminium alloy or one of its alloys.

7 Adjustable rail assembly as claimed in claim 5 wherein said casting is produced from magnesium alloy.

8 Adjustable rail assembly as claimed in any of the claims 5 to 7 wherein at least one leg for supporting the guide rail on a vehicle floor is provided on the casting.

9 Adjustable rail assembly further including a locking means which locks said first guide rail and said second slide rail in any one of a plurality of longitudinal positions relative to the other.

10 Adjustable rail assembly as claimed in claim 9 wherein said locking means comprises pawl means associated with either said guide rail or said slide rail and ratchet means associated with said slide rail or said guide rail associate.

11 Adjustable rail assembly as claimed in claim 10 wherein said pawl is provided with a plurality of teeth

12 Adjustable rail assembly as claimed in claim in 10 and or 11 wherein said ratchet means take the form of a toothed rack cast in said guide rail or said slide rail.

13 Adjustable rail assembly as claimed in claim 12 where said locking means comprises of at least a pair of pawl and ratchet means one of said pawl or ratchet means acting to lock the assembly against movement in one longitudinal direction and the other of said pair acting to lock the a assembly against movement in the other longitudinal direction.

14 Adjustable rail assembly as claimed in claim 13 wherein the ratchet means comprise two parallel ratchet racks cast on the surface of the guide rail.

15 Adjustable rail assembly as claimed in the preceding claims further comprising an electric motor powered positioning means wherein the switching means to energise and de-energise the electric motor also acts to disengage the locking means.

16 A guide rail for an adjustable rail assembly as claimed in any of the preceding claims.

17 A slide rail for an adjustable rail assembly as claimed in any of the preceding claims

18 Adjustable rail assembly as herein described and illustrated in figures 1a 1b 1c 1d of the accompanying drawings.

19 Adjustable rail assembly as herein described and illustrated in figures 2 2a 3 4 5 and 6 of the accompanying drawings.

20 Adjustable rail assembly as herein described and illustrated in figures 7a 7b 7c and 8 of the accompanying drawings.

The Patent Office

12

Application No: GB 9625950.2
Claims searched: 1-15, 18-20

Examiner: Neil Franklin
Date of search: 27 November 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): A4L (LCC)

Int Cl (Ed.6): B60N 2/06, 2/08, 2/12

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2 219 733A	(TACHI-S) See separate rail sections in Fig 4	
A	WO 95/01888A1	(NORSK HYDRO) See separate rail sections 21 & 22 in Figure 1	
A	US 4 940 285	(AINSIN SEIKI K K) See sections 12c,39 of guide rail of Figure 3	
A	US 4 901 421	(TAKANABE) See rail sections 3,17 in Figure 1	

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